

Tanta University	3 rd year, Computers & Control Dept.
Faculty of Engineering	Digital Signal Processing

Sheet 2

1. State whether the following system are static, linear, shift invariant, causal, and stable.

- a. $y(n) = n x(n)$
- b. $y(n) = a x(n)$
- c. $y(n) = x(n^2)$
- d. $y(n) = \sum_{-\infty}^n x(k)$
- e. $y(n) = x(n) + 3u(n+1)$
- f. $y(n) = g(n) x(n)$ where $g(n)$ is another sequence.

2. State whether the following system are stable or not.

- a. $h(n) = 4^n u(n)$
- b. $h(n) = u(n) - u(n-a)$

3. Compute the convolution of the following sequences:

- a. $x(n) = \{1, 2, -1\}$ and $h(n) = x(n)$
- b. $x(n) = \{1, 2, 3, 4, 5\}$ and $h(n) = \{1\}$
- c. $x(n) = h(n) = \begin{cases} 1, & -1 \leq n \leq 1 \\ 0, & \text{elsewhere} \end{cases}$
- d. $x(n) = \begin{cases} 1, & n = -2, 0, 1 \\ 2, & n = -1 \\ 0, & \text{elsewhere} \end{cases}$ and
 $h(n) = \delta(n) - \delta(n-1) + \delta(n-4) + \delta(n-5)$

e. $x(n) = u(n) - u(n - 5)$ and
 $h(n) = u(n - 2) - u(n - 8) + u(n - 11) - u(n - 17)$

f. $x(n) = u(n)$ and $h(n) = a^n u(-n - 1)$, $a > 1$

g. $x(n) = u(n)$ and $h(n) = (0.5)2^n u(-n)$

h. $x(n) = \left(\frac{1}{2}\right)^n u(n)$ and $h(n) = \left(\frac{1}{4}\right)^n u(n)$

4. For LTI system $y(n) = x(n) + 0.5 x(n - 1) + 0.25 x(n - 2)$, if a unit step i/p sequence is applied, find the o/p using convolution.